UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER
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ART UNIT	PAPER NUMBER
2857	

DATE MAILED: 04/18/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 07-01)

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE _3_ MONTH(S) FROM
THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed
  after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any
  earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) ☒ Responsive to communication(s) filed on _11 March 2003_ .

2a) ☐ This action is **FINAL**.   2b) ☒ This action is non-final.

3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is
     closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4) ☒ Claim(s) _1-10, 14-17, 22-25, 28-43, 48-51, 58-65 and 70_ is/are pending in the application.

   4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5) ☒ Claim(s) _14-17 and 48-51_ is/are allowed.

6) ☒ Claim(s) _1-6, 9, 10, 22-25, 28-39, 42, 43, 58-65, and 70_ is/are rejected.

7) ☒ Claim(s) _7, 8, 40 and 41_ is/are objected to.

8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9) ☐ The specification is objected to by the Examiner.

10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.

   Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.

   If approved, corrected drawings are required in reply to this Office action.

12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

   a) ☐ All   b) ☐ Some * c) ☐ None of:

      1. ☐ Certified copies of the priority documents have been received.

      2. ☐ Certified copies of the priority documents have been received in Application No. _____ .

      3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage
         application from the International Bureau (PCT Rule 17.2(a)).
   * See the attached detailed Office action for a list of the certified copies not received.

14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

   a) ☐ The translation of the foreign language provisional application has been received.

15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .

4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____ .

DETAILED ACTION

Election/Restrictions

1.   Applicant's election without traverse of Group 1, claims 1-10, 14-17, 22-25, 28-43, 48-

51, 58-65, and 70 in Paper No. 6 is acknowledged.

Claim Rejections - 35 USC § 102

1.   The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the

basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in-
> (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effect under this subsection of a national application published under section 122(b) only if the international application designating the United States was published under Article 21(2)(a) of such treaty in the English language; or
> (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that a patent shall not be deemed filed in the United States for the purposes of this subsection based on the filing of an international application filed under the treaty defined in section 351(a).

2.   Claims 1-6, 9, 22-25, 28-35, 42, 43, 58-65, and 70 are rejected under 35 U.S.C. 102(e) as

being anticipated by U. S. Publication 2002/0113966 to Shchegrov et al.

        With respect to claims 1 and 70, Shchegrov et al. disclose a method of determining a first

actual profile associated with a first grating comprising: receiving a set of measurements

associated with a signal indicative of diffraction from the grating and generating actual spectrum

signal data associated with the grating (see Fig. 5A and paragraphs 0008, 0042-0045, and 0047);

selecting a first trial profile and generating a first trial spectrum signal data associated with the

first trial profile (see Fig. 5A and paragraphs 0008, 0047, and 0051); comparing the first trial

spectrum signal data to the first actual spectrum signal data (see Fig. 5A and paragraph 0051)

and determining parameter values for a second trial profile using at least one optimization

technique, wherein the second trial profile is associated with a second sample trial spectrum

signal data, and wherein the second trial profile matches the first actual profile more closely than

the first trial profile (see Fig. 5A and paragraphs 0051-0056 and 0060).

As to claim 2, Shchegrov et al. also disclose a global optimization technique (see

paragraph 0053).

As to claim 3, Shchegrov et al. also disclose using the at least one optimization technique

to generate a plurality of additional trial profiles, each of the plurality of additional trial profiles

having an associated additional trial spectrum signal data, wherein each additional trial profile

generated matches the actual profile more closely than previously generated additional sample

profiles (see Fig. 5A and paragraph 0051).

As to claims 4 and 5, Shchegrov et al. also disclose storing the first trial profile, the

second trial profile, the additional trial profiles, the first trial parameter set, the second trial

spectrum signal data, and the additional trial spectrum signal data to a dynamic library of profiles

(see Fig. 6B and paragraph 0060).

As to claim 6, Shchegrov et al. also disclose determining a second actual profile

associated with a second grating, including: receiving a second set of measurements to obtain a

second actual spectrum signal data associated with the second grating; and comparing the second

actual spectrum signal data to one or more of the spectrum signal data stored in the dynamic

library of profiles (see Fig. 5A and paragraphs 0051 and 0060).

As to claim 9, Shchegrov et al. also disclose at least one member selected from the group

consisting of reflectivity and change in polarization states (see paragraph 0030).

As to claims 22, 58, and 59, Shchegrov et al. also disclose a method of determining a profile, comprising: receiving a set of measurements associated with an actual signal (see Fig. 5A and paragraphs 0008, 0042-0045, and 0047); searching a profile library for a closest matching set of trial parameter values, wherein the set of trial parameter values is associated with a trial signal and determining whether the trial signal satisfies a goodness of fit threshold (see paragraph 0051).

Shchegrov et al. do not disclose expressly displaying the closest matching set of trial parameter values if the trial signal satisfies the threshold.

It is, however, considered inherent that Shchegrov et al. add displaying the closest matching set of trial parameter values if the trial signal satisfies the threshold (see Figs 4a-4f and computer 40 shown on Fig. 9), because such function provided by the computer is known to be necessary in order that further analysis can be generated by the user via the display.

As to claims 24, 25, and 62-65, Shchegrov et al. also disclose if the trial signal does not satisfy the threshold, changing at least one parameter range associated with at least one of the trial parameter values (see paragraph 0051).

As to claims 23, 60, and 61, Shchegrov et al. do not disclose expressly communicating an error message if the trial signal does not satisfy the threshold.

It is, however, considered inherent that Shchegrov et al. add communicating an error message if the trial signal does not satisfy the threshold (computer 40 shown on Fig. 9), because such function provided by the computer is known to be necessary in order that error message can be displayed in the screen to warn the user that the trial signal is outside the specified ranges.

As to claims 28 and 29, Shchegrov et al. also disclose a computer program product for use in determining a first actual profile associated with a first grating, said computer program product comprising: a computer usable medium including computer readable program code embodied in said medium for causing determining the first actual profile; computer readable program code for causing a computer to effect receiving a signal indicative of diffraction from the grating; and computer readable program code for causing said computer to effect generating actual spectrum signal data associated with the grating (see Fig. 5A and paragraphs 0008, 0034, 0035, 0042-0045, 0047, 0069, and 0075-0077); computer readable program code for causing said computer to effect selecting a first trial profile and computer readable program code for causing said computer to effect generating a first trial spectrum signal data associated with the first trial profile (see Fig. 5A and paragraphs 0008, 0034, 0035, 0047, 0051, and 0075-0077); computer readable program code for causing said computer to effect comparing the first trial spectrum signal data to the first actual spectrum signal data; and computer readable program code for causing said computer to effect determining parameter values for a second trial profile using at least one optimization technique, wherein the second trial profile is associated with a second sample trial spectrum signal data, and wherein the second trial profile matches the first actual profile more closely than the first trial profile (see Fig. 5A and paragraphs 0034, 0035, 0051-0056, 0060, and 0075-0077).

As to claims 30 and 31, Shchegrov et al. also disclose at least one optimization technique to generate a plurality of additional trial profiles, each of the plurality of additional trial profiles having an associated additional trial spectrum signal data, wherein each additional trial profile

generated more closely than previously generated additional sample profiles matches the actual

profile (see Fig. 5A and paragraph 0051).

As to claims 32, 33, 34, and 35, Shchegrov et al. also disclose storing the first trial

profile, the second trial profile, the first trial spectrum signal data, and the second trial spectrum

signal data to a dynamic library of profiles (see Fig. 6B and paragraph 0060).

As to claims 42 and 43, Shchegrov et al. also disclose at least one member selected from

the group consisting of reflectivity and change in polarization states (see paragraph 0030).

Claim Rejections - 35 USC § 103

3.   Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Shchegrov et al.

in view of U. S. Patent No. 4,999,508 to Hyakumura.

As noted above, Shchegrov et al. disclose the claimed invention, except for at least one of

optimization technique including a steepest descent technique.

Hyakumura teaches at least one of optimization technique including a steepest descent

technique (see col. 10, lines 21-48).

It would have been obvious to one having ordinary skill in the art at the time the

invention was made to modify Shchegrov et al.'s method to include at least one of optimization

technique including a steepest descent technique, as taught by Hyakumura, in order that short

time for the calculation of values can be provided (see Hyakumura, col. 10, line 43).

4.   Claims 36-39 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shchegrov

et al. in view of U. S. Patent No. 6,476,920 to Scheiner et al.

As noted above, with respect to claims 36-39, Shchegrov et al. disclose the claimed invention, except for a receiver for computer readable program code for causing said computer to effect determining a second actual profile associated with a second grating, including: computer readable program code for causing said computer to effect receiving a second set of measurements to obtain a second actual spectrum signal data associated with the second grating; and computer readable program code for causing said computer to effect comparing the second actual spectrum signal data to one or more of the spectrum signal data stored in the dynamic library of profiles.

Scheiner et al. teach a receiver for computer readable program code for causing said computer to effect determining a second actual profile associated with a second grating, including: computer readable program code for causing said computer to effect receiving a second set of measurements to obtain a second actual spectrum signal data associated with the second grating; and computer readable program code for causing said computer to effect comparing the second actual spectrum signal data to one or more of the spectrum signal data stored in the dynamic library of profiles (see Figs 5A and 5B and col. 12, lines 9-57).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Shchegrov et al.'s method to include a receiver for computer readable program code for causing said computer to effect determining a second actual profile associated with a second grating, including: computer readable program code for causing said computer to effect receiving a second set of measurements to obtain a second actual spectrum signal data associated with the second grating; and computer readable program code for causing said computer to effect comparing the second actual spectrum signal data to one or more of the

spectrum signal data stored in the dynamic library of profiles, as taught by Scheiner et al., in

order that further location on the surface of the structure can be inspected (see Scheiner et al.,

col. 12, lines 56-57).

Allowable Subject Matter

5.   Claims 7,8, 40, and 41are objected to as being dependent upon a rejected base claim, but

would be allowable if rewritten in independent form including all of the limitations of the base

claim and any intervening claims.

6.   Claims 14-17 and 48-51 are allowed.

7.   The following is a statement of reasons for the indication of allowable subject matter:

        U. S. Publication 2002/0113966 to Shchegrov et al. is the reference closest to the claimed

invention. Shchegrov et al. disclose a method of determining a profile associated with a grating,

comprising: receiving a measured signal; selecting a set of trial parameter values; generating a

simulated signal, and storing the simulated signal in the database or another storage medium.

However, Shchegrov et al. do not disclose determining whether the set of trial parameter values

is stored in a database, wherein if the set of trial parameter values is stored in the database,

searching the database for a trial signal associated with the set of trial parameter values, and

wherein if the set of trial parameter values is not stored in the database, storing the set of trial

parameter values in the database, performing an electromagnetic simulation associated with the

set of trial parameter values; and including all of the other limitations in the respective

independent claims.

Conclusion

8.   The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Sezginer et al. disclose alignment accuracy between two or more patterned layers being measured using a metrology target comprising substantially overlapping diffraction gratings formed in a test area of the layers being tested.

Wright discloses a method for determining conformality of a process layer including providing a wafer having a grating structure and a process layer formed over the grating structure; illuminating at least a portion of the process layer overlying the grating structure with a light source; measuring light reflected from the illuminated portion of the grating structure and the process layer to generate a reflection profile; and determining conformality of the process layer based on the reflection profile.

Stirton discloses a method for controlling a photolithography process including providing a wafer having a first grating structure and a second grating structure overlying the first grating structure; illuminating at least a portion of the first and second grating structures with a light source; measuring light reflected from the illuminated portion of the first and second grating structures to generate a reflection profile; determining an overlay error between the first and second grating structures based on the reflection profile; and determining at least one parameter of an operating recipe for a photolithography stepper based on the determined overlay error.

Lensing et al. disclose a method of using scatterometry measurements to determine and control gate electrode profiles.

Davis et al. disclose a fiber Bragg grating peak detection system having a broadband

source that provides a broadband optical signal, a fiber Bragg grating and a variable

threshold and/or grating profile peak detection unit.

Contact Information

9.   Any inquiry concerning this communication or earlier communications from the

examiner should be directed to Carol S. Tsai whose telephone number is (703) 305-0851. The

examiner can normally be reached on Monday-Friday from 7:30 AM to 4:00 PM. If attempts to

reach the examiner by telephone are unsuccessful, the examiner's supervisor, Marc S. Hoff can

be reached on (703) 308-1677. The fax number for TC 2800 is (703) 308-7382. Any inquiry of a

general nature or relating to the status of this application or proceeding should be directed to the

TC 2800 receptionist whose telephone number is (703) 308-1782.

In order to reduce pendency and avoid potential delays, Group 2800 is encouraging

FAXing of responses to Office actions directly into the Group at (703) 308-7382. This practice

may be used for filing papers not requiring a fee. It may also be used for filing papers which

require a fee by applicants who authorize charges to a PTO deposit account. Please identify the

examiner and art unit at the top of your cover sheet. Papers submitted via FAX into Group 2800

will be promptly forwarded to the examiner.

Carol S. Tsai

03/16/03

MARC S. HOFF
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